

Refining Processes

Hydrogen peroxide helps maintain dissolved oxygen levels during an outage at a refinery complex

By Michael Fagan

In the summer of 2010, a large refinery complex in the Northeast was facing a two- to three-month maintenance outage on one of two aeration basins in its activated sludge wastewater treatment system. During the outage, all of the refinery wastewater would need to be routed through the one remaining aeration basin. Because the refinery periodically had difficulty maintaining dissolved oxygen (DO) levels with both aeration basins in service, they needed

a temporary and non-capital means to provide the biological treatment system with supplemental DO during the maintenance outage.

Hydrogen peroxide (H_2O_2) has been used as a source of supplemental DO in activated sludge treatment systems for decades. In the aeration basin mixed liquor, H_2O_2 converts to DO according to the following reaction: $2 H_2O_2 \rightarrow O_2 + 2 H_2O$

This decomposition to DO occurs very rapidly due to the catalytic effect

of enzymes (e.g., catalase) present in all activated sludge mixed liquors, and thus provides an immediate source of DO to the biomass. Because H_2O_2 is a liquid, and infinitely soluble in water, the amount of DO provided is not limited by mass transfer of oxygen from the gas phase to the liquid, as is the case with mechanical aeration.

Dosing Solution

When the maintenance outage was initiated and wastewater flow was diverted to the remaining aeration basin, DO levels rapidly dropped from the target range of 2 to 3 mg/L to near zero (0.1 to 0.2 mg/L). Dosing of 27% H_2O_2 into the effluent of the dissolved air floatation unit just upstream of the aeration basin was started to offset this unacceptable drop in DO. Within a matter of hours, a measurable DO increase was observed and continued to trend upward throughout the day.

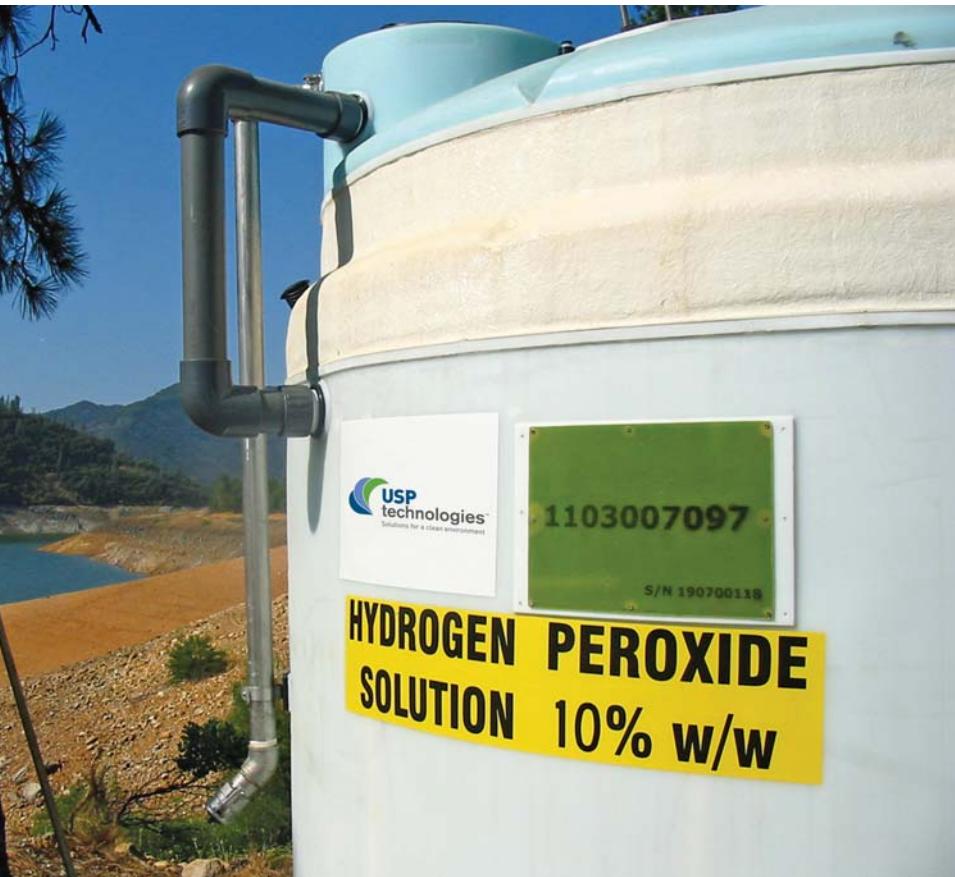
Within 24 hours of starting H_2O_2 dosing, the DO levels in the aeration basin were back in the 1 to 2 mg/L range, and within 48 hours had reached the refinery targeted 2 to 3 mg/L range. Dosing of 27% H_2O_2 was continued throughout the maintenance outage and maintained the DO levels required for effective biochemical oxygen demand (BOD) removal and nitrification (ammonia removal).

During the outage, the refinery experienced no filamentous bulking episodes. This translated to good clarifier settling, which historically had been a concern when treatment system DOs were experienced.

Scope of Supply

The refinery contracted USP Technologies to provide a supply scope that included:

- 27% refinery-grade H_2O_2 ;



Hydrogen peroxide has been used as a source of supplemental dissolved oxygen in activated sludge treatment systems for decades.



Aeration basin

- Engineered storage and dosing equipment system;
- Equipment installation and maintenance services during the project;
- Remote monitoring and product inventory management; and
- Applications services, including dose rate optimization and process hazard analysis support and safety training.

The 27% H₂O₂ treatment program offered the refinery several benefits. The supply scope provided a safe and cost-effective solution for supply of supplemental DO to this large refinery during the maintenance outage. The biological treatment system's performance during the outage convinced the refinery to maintain the H₂O₂ storage and dosing system on site to provide supplemental DO on an as-needed basis during periods of high BOD/chemical oxygen demand loading, upstream process upsets and filamentous bulking episodes. **IWWD**

Michael Fagan is director, industrial business and technology development for USP Technologies. Fagan can be reached at mfagan@uspstechnologies.com or 908.362.1000.

WaterPOD

Containerized Water Treatment Units



Small footprint water treatment systems designed for the removal of heavy metals and other contaminants from drinking water. WaterPOD containerized treatment units are the ideal solution for sites where space, cost, and schedule are critical.



(866) 823-3343 | www.adedgetech.com
sales@adedgetechnologies.com